



FOOD HABITS OF ADULT PHEASANTS IN MICHIGAN BASED ON CROP ANALYSIS METHOD

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This investigation of the food habits of the pheasant¹ was centered in the general farming region of southern Michigan. Data were collected from June 1930 to July 1, 1933.

The food habits of the ring-necked pheasant have been investigated to some extent by other workers in several parts of the United States. McAtee ('12) reported on a few stomachs collected during the fall months in Washington and Oregon. Burnett ('21) reported on the crop analyses of 45 pheasants collected near Fort Collins, Colorado, during all seasons of the year. A count was made of all food items, but no percentages were computed. Maxson ('21) made a report on the crop and gizzard analyses of 12 male pheasants collected in summer, fall, and early winter near Longmont, Colorado. He interpreted the data in respect to the economic status of the pheasant in the particular area where the investigation was conducted. Another investigation was conducted by Cottam ('29) in Utah County, Utah. Pheasants were collected at all seasons of the year. The results were based upon the crop and gizzard analyses of 45 pheasants. The volumetric methods used in analyzing the various foods were the same as those employed by the U. S. Biological Survey.

A more extensive study of the food habits of the pheasant was undertaken by Swenk ('29) in Valley County, Nebraska. The crops and gizzards of 100 pheasants collected in every month of the year were examined. Results were based upon net weight.

Severin ('33) made a report on the stomach analyses of 285 adult pheasants collected in South Dakota during all months of the year. Results and interpretations are based upon the numerical method of stomach analysis. The investigation was conducted primarily to determine the economic status of the pheasant in that state.

Leffingwell ('28) described the general feeding habits of pheasants from birds collected from various parts of the United States, but gave no quantitative data upon the foods eaten throughout the year. The method of analysis was by counting rather than by weight. In addition to the above-mentioned

¹ The introduced pheasant in Michigan is a mixture of *Phasianus torquatus* Gmel., the Chinese ring-necked pheasant; *Phasianus colchicus* L., the Caucasian pheasant, or so-called English blackneck, and *Phasianus versicolor* Vieillot, the green Japanese pheasant. Probably very few Chinese ringnecks occur in the state.

investigations, some shorter articles and notes concerning the food habits of the pheasant in the United States are to be found scattered through ornithological literature.

Dry weight was used in this investigation as the method of analyzing crops and computing percentages. This method not only shows the kind and amount of food eaten, but also makes possible the expression of food constituents, proteins, fats, and carbohydrates in generally accepted terms. The method does, however, tend to overemphasize the grains eaten during the summer as compared to insects.

The technic of crop analysis by the dry weight method was as follows: The contents of each crop were placed in a number 40 mesh sieve and the fine sand washed out. The food was then placed on a glass tray and the various items separated, identified, and put separately into small petri dishes. They were then dried in an electric oven. All items were allowed to remain in the oven until they had ceased to lose weight. Only ten to fifteen dishes were removed from the drying oven at one time so that the materials were exposed to the air for the minimum period. As a further precaution against possible absorption of moisture from the air while weighing, a glass desiccator was used to hold the dried materials when they were not actually on the balance. An analytical balance sensitive to .001 of a gram was used in weighing the dried crop contents. This permitted the accurate weighing of very small items of diet.

The percentages were based upon the total quantity of each item in all of the crops for a given period of time, and not upon the individual crop as a unit. Thus the individual variations which occur in the feeding habits were partly eliminated.

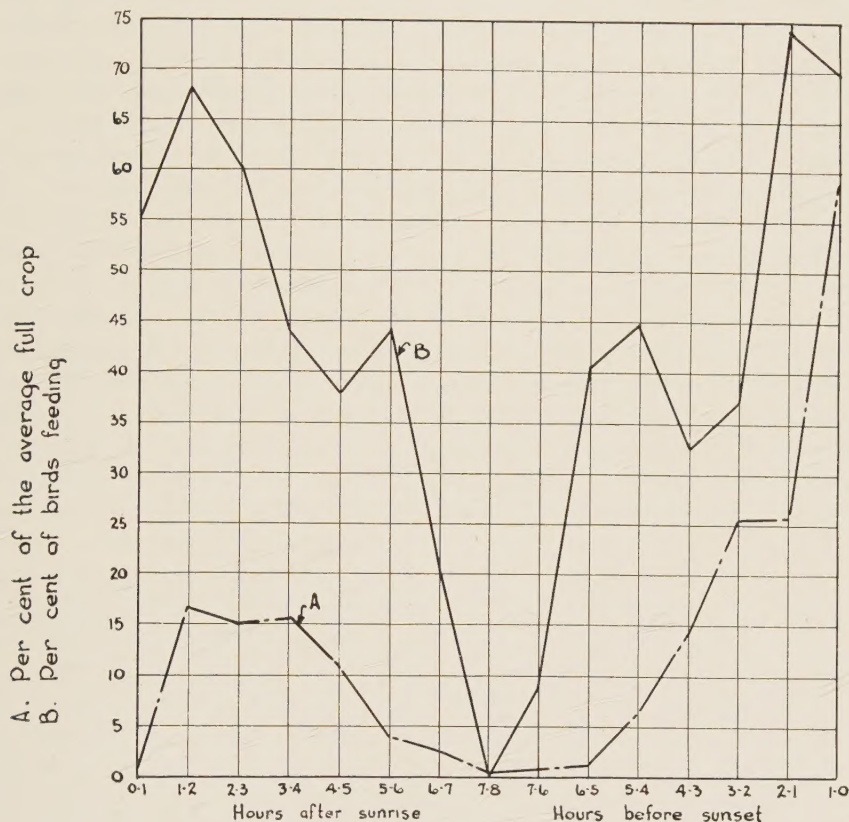
FEEDING HABITS

Adult pheasants usually do not commence feeding as soon as they leave the roost, but wander about, taking little or no food until about an hour after sunrise. During this period they frequently may be observed crossing roads, in lanes, or along borders of open fields. In summer the early morning activity consists mostly of playing or exercising, while in the winter it is usually spent in standing or crouching under shrubby or herbaceous cover.

In the course of this study² pheasants were collected at all seasons of the year, and at all hours of the day. Thus the crop analysis gives much informa-

² Agencies that have cooperated in this project at one time or another are the Izaak Walton League of America, the Michigan Dept. of Conservation, the Michigan Dept. of Agriculture, the U. S. Biological Survey, the Sporting Arms and Ammunition Manufacturers Institute, the American Game Association, the Michigan State College, the University of Michigan, the Williamston Progressive Hunting Club, and other farmers in Williamston Township, Ingham County, Michigan. Particular credit is due Mr. Harry F. Harper, without whose enthusiastic moral support and generous financial backing, the project would have been impossible. The project was directed by Professor H. M. Wight, of the School of Forestry and Conservation, University of Michigan.

tion concerning the daily feeding periods. Curve *A*, in figure 1, shows the average amount of food in the crops during the course of the day and is based upon the analysis of 352 crops. Curve *B* represents the percent of pheasants observed feeding throughout the day. This curve is based upon the observations of 3,832 pheasants during all seasons of the year. Both curves indicate that the feeding period in the morning is at the maximum between one and



A. Average amount of food in crops of adult pheasants.
B. Distribution of pheasants observed feeding.

FIG. 1. Graph of pheasant feeding during the day.

two hours after sunrise.³ The rapid increase in the number of pheasants observed feeding after the first hour is due to the fact that a pheasant fills its entire digestive tract with food before there is a marked decrease in feeding activity. At noonday practically all pheasants are inactive, and with a minimum amount of food in their crops. Of all the pheasants observed during

³ The official time given by the U. S. Weather Bureau is the hour of sunrise or sunset upon which all the calculations are based.

the noonday period, 91 per cent were inactive, and none were observed feeding.

Although the number of pheasants observed feeding during the first three hours after mid-day increased rapidly, the crop analysis curve indicates that little food was eaten. The intensive afternoon feeding period begins about four hours before sunset and continues until roosting time. The maximum number of pheasants observed feeding occurred one to two hours before sunset. At this time of the day, nearly 75 per cent of the birds were feeding. By sunset the number of feeding birds had declined to 70 per cent, the remaining 30 per cent were either inactive, standing in fence rows, road lanes, fields, sitting on fences, walking, or flying toward their roosting areas.

Table I shows, in addition to the daily distribution of food per hour, the average crop weight and the number of birds collected in each period. All calculations are based upon a full crop, as found in wild birds. The average of the fifty heaviest crops was taken as 100 per cent. On this basis it was found that the average maximum crop content was 19.02 grams. All pheasants do not go on the roost with full crops. Out of 63 pheasants collected at sunset or during the hour before, only 9 had eaten more than 19 grams. Although the crop may not be full at roosting time, it was found that pheasants usually have the other parts of the digestive tract full of food by sunset. Occasionally an exceedingly heavily filled crop may be found. For instance, of 352 pheasants, one was collected with 50 grams of food in its crop. The bird was a female, killed the last week in April, and was probably an incubating bird.

TABLE I. *Average weight of crops collected at different hours throughout the day*

Hours after sunrise	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8
No. of birds	10	35	21	37	31	3	4	2
Av. crop wt. in grams	.13	3.14	2.86	2.90	2.11	.78	.49	.02
Per cent av. full crop	.67	16.5	15.05	15.25	11.10	4.09	2.58	.08
Hours before sunset	8-7 ⁴	7-6	6-5	5-4	4-3	3-2	2-1	1-0
No. of birds		1	3	9	22	19	27	63
Av. crop wt. in grams			.19	1.36	2.70	4.86	4.86	11.54
Per cent av. full crop			1.00	7.15	14.20	25.53	25.53	60.66

⁴ No bird collected during this period, interpolated in chart.

In addition to seeds, fruit, and arthropods, pheasants eat much green food. Even though there may be 3 to 6 inches of snow on the ground, there are usually bare grassy spots in pastures, along ditch banks, or marsh borders where such food is available. In winter, the birds frequent such places and may be observed feeding upon grass. If no grain or seeds are easily available, they may feed exclusively on grass for short periods. The relatively high amount of grass eaten in the winter may thus be partly accounted for.

The pheasants diet is not entirely limited to food which is on or near the ground. For instance, burdock is frequently eaten in the winter and in order

to obtain the seeds, the birds must sometimes jump as high as 2 to 3 feet. Where any amount of feeding has been done on burdock, the burs become matted together. This plant, while essentially an emergency food, is sometimes eaten consistently by certain individuals when burdock is abundant. The burs are not always completely broken apart before being eaten. Burdock seeds in winter are usually heavily infested with the larvae of a moth (*Metzneria lappella* L.). In eating the seeds the birds consume the larvae as well. Pheasants also jump for the fruits of grape, nightshade, rose, and pokeberry. Occasionally pheasants are observed in apple trees, feeding on dried or frozen fruit.

Habit seems to play an important part in the feeding of pheasants. Once discovered, an area of abundant food will be visited repeatedly, often at regular intervals. In one case a flock was observed feeding upon frost grapes in an isolated area between two large grain stubble fields. Repeated observation showed the flock at this point at approximately the same hour each afternoon over a month's period during the winter. At the end of the winter the grape vines had been stripped entirely of their fruit.

On several occasions incubating hen pheasants have been observed feeding upon newly planted corn adjacent to wild herbaceous areas. The behavior exhibited by these hens resembled very closely the actions of domestic incubating hens. As soon as the hen pheasants came out into the cornfield, they fed rapidly for a half hour, occasionally pausing to stretch their wings and legs. Once a hen was seen to flap her wings during the feeding interval. In each instance, the hens appeared in the field from 4 to 4:30 p.m., approximately 3 to 4 hours before sunset and left as quickly as they had appeared. A cock pheasant was always seen with the hens. While the females fed rapidly, the cock bird appeared to be content to display and utter his grunting sound.

The pheasant is monivorous and takes almost any small animal or plant food accessible and abundant. This characteristic has enabled the bird to become established and increase in regions where natural and cultivated foods are very different from those in its native habitat in Eastern China. Cultivated grains, however, play an important part both in this country and in China (Beebe, '26).

In southern Michigan, we have records of 106 plant species being eaten by pheasants. In this list are representatives of 42 families. The grasses, Gramineae, are represented by 19 species, of which the cultivated grains form the most important part. The Rosaceae follows second with 10 species represented, and the Leguminosae with 7 species. The Compositae rank fourth with 6 species. One species, ragweed (*Ambrosia artemisiifolia*), is especially important as a food, and is available from September until April or May, an availability period lasting as long as waste field corn. One other species in this family, burdock (*Arctium minus*), is sometimes an important food in times of deep snow, and constitutes an excellent emergency food. The variety of species eaten is greatest in October, when the greatest number of plants

are bearing seeds and fruits. The minimum variety occurs in July when few wild plants are in seed and the diet consists principally of grain and insects (fig. 2).

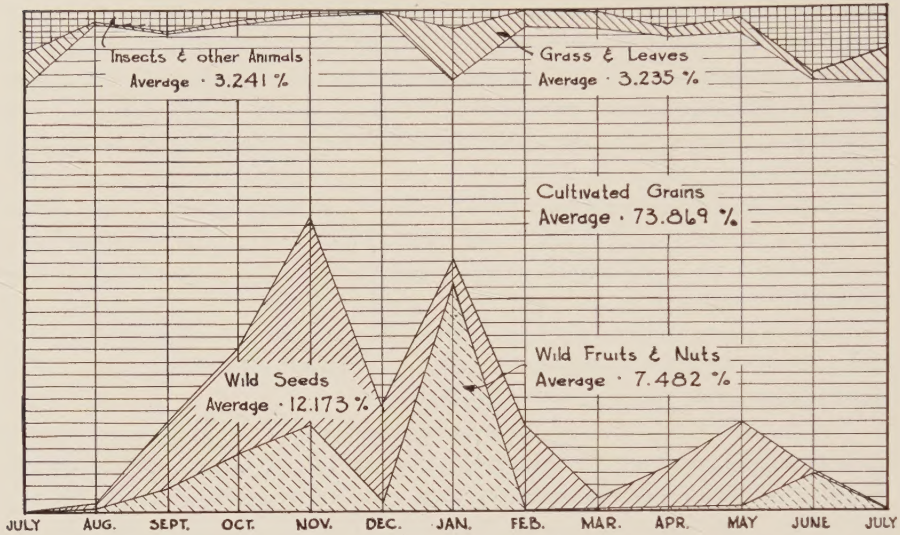


FIG. 2. Food of adult pheasants, showing the varying quantities of the principal foods and the average of each group.

In the following sections we shall present the information obtained from crop and gizzard analyses, supplemented by general observation. These data are based upon the examination of 352 crops; of this number, 86.36 per cent, or 304 pheasants, had food in their crops. Table II shows the number of pheasants examined each month.

TABLE II. *Number of pheasants collected by months (1930-1933)*

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
15	6	11	12	6	8	5	17	42	182	23	25

The vegetable constituents amount to 94 per cent of the annual food of adult pheasants. Cultivated grains form the major portion. Corn, wheat, barley, oats, buckwheat, and beans make up 74 per cent of the food for the year. Not only the adult pheasants but the young as well are highly granivorous.

The proportions of the various species of grain are shown in table IV. It would appear from these data that the pheasant is a rather expensive bird for the farmer to support, but, as we shall see, the bulk of the grains eaten are from field waste and from manure spread on the fields. Wheat and corn,

TABLE III. *Percentages of the principal foods of adult pheasants*

	Cultivated grains	Wild seeds	Fruits and nuts	Insects	Grass and leaves	Other animals
January per cent	35.957	4.480	45.751	3.581	10.231	0.000
February per cent	80.203	16.751	0.000	0.000	3.046	0.000
March per cent	86.083	2.896	0.308	0.006	10.707	0.000
April per cent	85.370	8.374	0.496	1.238	1.634	2.888
May per cent	77.532	17.043	0.594	0.640	3.307	0.884
June per cent	77.988	0.236	7.585	13.174	1.017	0.000
July per cent	84.527	0.000	0.000	8.240	7.162	0.071
August per cent	95.226	1.541	0.320	1.948	0.881	0.084
September per cent	78.525	13.182	4.243	3.891	0.107	0.052
October per cent	64.977	21.089	11.684	1.836	0.347	0.067
November per cent	40.684	41.699	17.108	0.268	0.238	0.003
December per cent	79.349	18.791	1.693	0.024	0.143	0.000

TABLE IV. *Per cent of cultivated grains eaten to the total yearly food and the percentage of each species of grain to the total amount of grain consumed*

Species	Per cent of year's food	Per cent of total grain eaten
Corn	33	45
Wheat	20	27
Barley	8	11
Beans	5	7
Oats	5	6
Buckwheat	3	4
	74	100

then, are the two most important grains in the food of the adult pheasant. The other three grains are less important, but even barley, which amounts to only 8 per cent, occurred in the crops in larger quantities than did ragweed, the most commonly eaten wild seed. These proportions will of course vary greatly in different localities depending upon the type of farming and the kinds of food available. It seems clear that if less waste grain were available, a larger proportion of weed seed would be eaten. The variation in the consumption of grain from month to month is presented in table V.

Wheat disappears from the diet in April, May, and June, but appears again with the harvesting of this grain. The large proportion of barley eaten in April and May comes from waste grain in newly sown fields. There is little need for pheasants to attempt digging out the newly sown grain for

TABLE V. *Percentage of the species of cultivated grain eaten of total food consumed for each month*

	Corn	Wheat	Barley	Beans	Oats	Buckwheat	Totals
Jan.	34	2	0	0	trace	0	36
Feb.	72	6	0	1	1	0	80
Mar.	47	40	0	0	0	0	87
Apr.	33	0	23	trace	2	27	85
May	28	trace	36	0	14	0	78
June	0	0	0	54	24	0	78
July	0	83	0	0	2	0	85
Aug.	1	73	15	0	6	0	95
Sept.	33	23	18	trace	1	3	78
Oct.	50	5	3	1	3	2	64
Nov.	28	6	2	3	2	0	41
Dec.	75	2	0	2	trace	0	79

there is usually much waste dropped at the ends of the fields. This is also true of the other small grains that are drilled. The highest percentage of grain consumed for any one month came in August, when wheat, barley, oats, and corn made up 95 per cent of the month's food. The low percentage in January is due chiefly to the presence of snow on the ground which covered the stubble fields.

In table VI is shown the distribution of the various grains during the spring, summer, autumn, and winter months.

TABLE VI. *Distribution of the total amount of cultivated grain eaten by adult pheasants for each season of the year*

Species	Summer	Fall	Winter	Spring	Totals
Corn	0.1	9.2	15.0	8.9	33.2
Wheat	0.8	3.3	13.0	2.8	19.9
Barley	1.2	1.9	0.0	4.9	8.0
Beans	4.5	0.4	0.3	0.0	5.2
Oats	2.6	0.5	0.1	1.3	4.5
Buckwheat	0.0	0.4	0.0	2.3	2.7
Totals	9.2	15.7	28.4	20.2	73.5 $\pm$ 15

In the general farming region, corn and wheat are the most important grains during the winter. Figure 3 shows that corn is eaten to a greater extent in winter than during the fall months. The chief source of all corn eaten, however, is field waste, and in the spring the source of this corn is often from manured fields. Although the data indicate that many beans are eaten in summer, this food was actually eaten only in early June. Buckwheat was eaten in the largest quantity during the spring and must therefore be waste grain.

The total amounts of plant and animal food eaten each month of the year

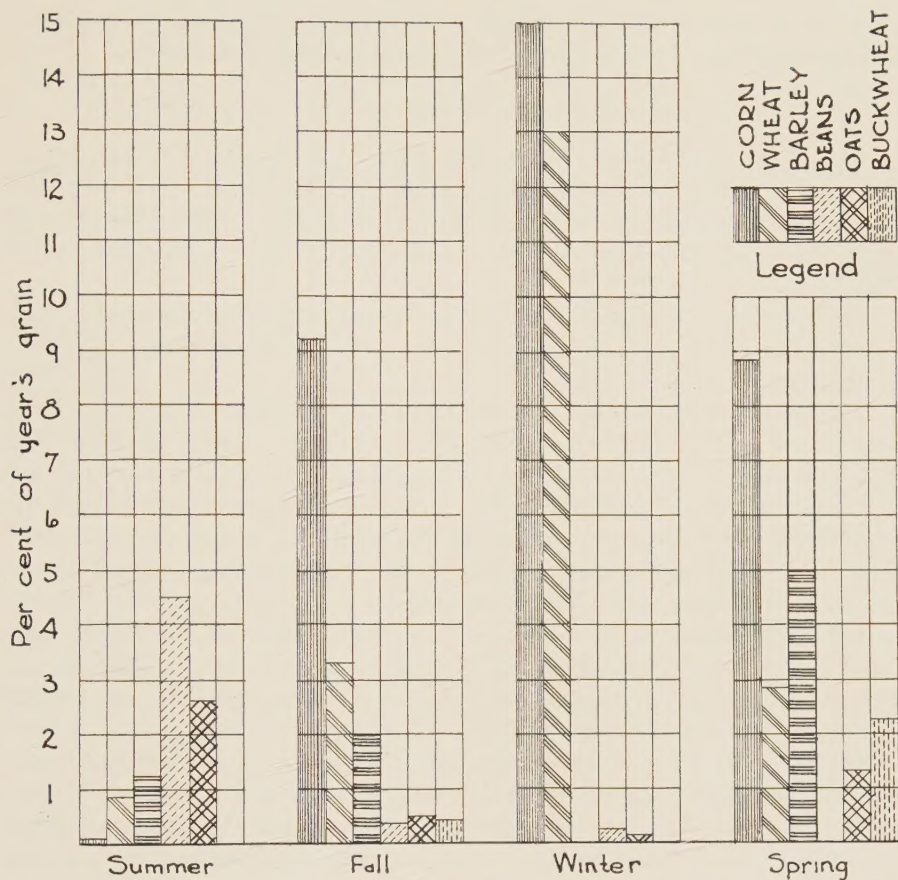


FIG. 3. Seasonal fluctuations of the cultivated grains eaten by adult pheasants. Percentages based upon the total grain of the year.

are shown in table VII. February was the only month in which no animal food was found.⁵

TABLE VII. *Percentage of plant and animal food eaten by adult pheasants for each month of the year*

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Plant....	96.4	100.0	99.9	95.9	98.5	86.8	91.7	97.9	96.1	98.1	99.8	99.9
Animal...	3.6	0.0	0.1	4.1	1.5	13.2	8.3	2.1	3.9	1.9	0.2	0.1

The percentage of plant food eaten each month is so high that the animal food is overshadowed. Their partiality to cultivated grains during all seasons

⁵ Several crops were collected after these data were assembled and the larvae of the March fly, *Bibio* sp., were found in two instances and one ladybird beetle was taken from a third crop.

of the year indicates that pheasants in Michigan are essentially farm-game birds, rather than birds of the border line agricultural communities.

WILD SEEDS AND FRUITS EATEN BY ADULT PHEASANTS

The July crop analyses indicate that no wild seeds are consumed during that month. Since the number of crops for July is hardly a fair sample, the examination of gizzards and droppings reveal, however, that although the quantity of wild seeds⁶ fed upon was small, nevertheless ten different species were eaten.

Neither did wild fruits appear in the crop analyses, but raspberries and immature fruits of panicled dogwood were found in droppings and gizzards of pheasants in July.

Pheasants in areas where there are large raspberry thickets fed extensively upon these fruits. Droppings collected from birds feeding in raspberry thickets were colored a light pink for a period of two to three weeks, and the seeds were consistently found in the feces, showing that raspberries were being eaten continually. Cherry pits of the wild black cherry (*Prunus serotina*) were frequently found in July droppings. Pheasants have also been observed occasionally eating cultivated cherries from the ground.

Leaves and grass made up 7.2 per cent of the food for July and consisted for the most part of alfalfa and clover leaves. Direct observations upon pheasants indicate that there is, on the part of some pheasants, a distinct preference for wild lettuce over clover or alfalfa.

Beginning in the latter part of August, various species of seeds and fruits become available and are consumed in increasing amounts. Yellow (*Setaria glauca*) and green (*Setaria viridis*) foxtail are among the late summer favorites, while ragweed which begins to mature in September formed 3.6 per cent of the month's food. It assumed an important part of the seed diet from that time until the end of March. The period of abundance for yellow and green foxtail is comparatively short. They reach their maximum in September, when they make up 9.0 per cent of the food. Yellow foxtail is found more generally over large areas of diversified farm land than is green foxtail. This accounts for the larger percentage observed in the crops. Other September seeds eaten sparingly were barnyard grass, smartweed, bur marigold, chess, and prickly ash. Fruits and nuts, although still rather unimportant at that season, form 4.2 per cent of the month's food.

The variety of plant food reached a maximum in October. At that time a total of 47 species were eaten. Although many species of plants were available, pheasants preferred the cultivated grains, and the principal seed species remained nearly the same as for September.

Odd items of food which appear in October may have been due to some disturbance such as hunting. Pheasants forced to remain under cover during

⁶ The principal species referred to here are the yellow and green foxtail, the two species of wild grasses most attractive to pheasants in southern Michigan.

feeding periods will vary their normal diet by selecting foods ordinarily not eaten. For instance, the small seeds of the common pigweed (*Chenopodium album*) were found in 2 out of 182 crops, yet it comprised 1.0 per cent for the month.

TABLE VIII. Percentages of the more important wild seeds eaten by adult pheasants based upon crop analysis

	Per cent of total year's food	Per cent of total quantity of seeds eaten
Ragweed (<i>Ambrosia artemisiifolia</i>)	6.3	51.4
Hog peanut (<i>Amphicarpa monoica</i>)	1.6	12.9
Yellow foxtail (<i>Setaria glauca</i>)	1.1	8.8
Skunk cabbage (<i>Symplocarpus foetidus</i>)	1.0	8.2
Green foxtail (<i>Setaria viridis</i>)	0.9	7.5
Black bindweed (<i>Polygonum convolvulus</i>)	0.5	3.0

By October, all wild fruits have ripened and are usually still retained on the vines and shrubs. Among the more important species are frost grape, panicled dogwood, and nightshade. Others of minor importance are hawthorne, elderberry, ground cherry, and poison ivy. Although fruits and nuts are readily available, they formed only 11.6 per cent of the month's food.

During November, a rapid increase in the consumption of wild weeds, fruits, and nuts was noted. The maximum consumption occurred in that month, amounting to 41.6 per cent of all the food. Of all wild seeds available in southern Michigan, ragweed seems to be the pheasants' first choice. Stubble fields of wheat, oats, barley, rye, and corn are its ideal habitats. Its wide distribution, abundance, and accessibility make it a most important food other than the cultivated grains.

TABLE IX. Percentages of the more important fruits eaten by adult pheasants, based upon crop analysis

	Per cent of total of year's food	Per cent of total amount of fruits eaten
Frost grape (<i>Vitis vulpina</i>)	4.1	54.3
Panicled dogwood (<i>Cornus paniculata</i>)	0.4	5.3
Nightshade (<i>Solanum dulcamara</i>)	0.3	3.9
Elderberry (<i>Sambucus canadensis</i>)	0.2	2.8

The importance of fruits during periods of deep snow is readily seen by the increased proportion of frost grape in the diet of pheasants during November, after the first snow storm has occurred, and also by numerous direct observations of birds feeding on grapes and nightshade. Pheasants tend to frequent shrub areas and thickets during such weather and are consequently more closely associated than usual with the wild fruits, particularly frost grape. In certain areas where frost grape was abundant, pheasants were observed feeding upon this source of food almost to the exclusion of

other nearby foods such as ragweed and burdock. Black chokeberry is known to have repeatedly wintered over a flock of pheasants in an otherwise unproductive food area.

The percentage of wild seeds declined sharply in December to 18.7 per cent. Ragweed and black bindweed (*Polygonum convolvulus*) were commonly eaten. Pheasants collected in stubble fields had fed extensively at times upon the black bindweed. The speckled beans of the hog peanut (*Amphicarpa monoica*) were eaten consistently in small quantities in areas where this plant is common. During December only 12 species of seeds were recorded in the crop analyses. Tracking in the snow brought the total of all seed species eaten up to twenty-nine. This is especially interesting in view of the logical assumption that some foods may be so completely digested as to be indistinguishable in the droppings.

The low percentage of wild seeds eaten during January may be explained by the fact that at the various times when the fifteen pheasants were collected, snow was either on the ground or the birds were collected in areas where the grain fields had been thoroughly pastured. Wild fruits, especially frost grape, were consumed to the amount of 45.7 per cent of the month's food.

The number of weed seed species in crops during February showed a marked decline over January. This may be partly accounted for by the presence of snow on the ground and the smaller number of crops examined for this month. The February birds were collected in 1932 and 1933 in an area where the total snow for this month was 6.0 and 8.7 inches, respectively, whereas in January it was only 0.5 and 0.8 inches. Fecal analysis indicates that the following species, other than ragweed, were eaten in moderate amounts: black bindweed, pigweed, smartweed, frost grape, and panicked dogwood. Tracking in the snow indicated that the two latter species were eaten whenever available. The snow under grape and dogwood thickets was often packed hard through continual use by pheasants.

During March, grass and leaves played an important rôle as a pheasant food, amounting to 10.7 per cent of the total.

The sudden increase in the amounts of grass and leaves eaten by pheasants in late winter cannot be adequately explained on the basis of availability. Pheasants are within the breeding season by March and this increase in green food may be very likely a seasonal dietetic requirement associated with reproduction. Frost grape was still available and where flocks were not broken up, the birds were observed feeding regularly upon the remnants of this fruit. The chief seed species eaten was skunk cabbage. The small amount of ragweed found in the crops for March represents the last of the easily available supply. In April, as in March, the chief seed species found in the crops was skunk cabbage. Although skunk cabbage was present in sufficient quantity by dry weight to make it appear important, it is not widely distributed. The high percentage in this case appears to be only a chance occurrence.

The percentage of wild seeds for May does not represent a good average because a single pheasant apparently had found a place where the hog peanut was still plentiful and had filled up on it. The seeds comprised 17.0 per cent of the month's food.

In June when adult pheasants are more insectivorous in their feeding habits than in any other month of the year, even the early ripening seeds are not overlooked. The seeds of the common chickweed (*Cerastium vulgatum*) and cleavers (*Galium Aparine*) are eaten in small quantities.

From the foregoing discussion of plant foods, one point stands out conspicuously. The pheasant finds satisfactory food in a great variety of plants and among these the kind of food eaten at any time depends primarily upon its availability, rather than the species.

ANIMAL FOOD

The quantity of animal food consumed by peasants during a year's time amounts to only 3.2 per cent of the total food eaten—an item which appears rather unimportant compared to the plant foods consumed. Of all the animal food taken, insects comprise by far the largest proportion. The percentage distribution of these animals is shown in table X.

TABLE X. *Percentage distribution by months of insects eaten by adult pheasants*

Order	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Lepidoptera	0.0	0.0	0.0	trace	0.2	10.1	8.2	0.1	1.1	trace	trace	0.0
Diptera	3.6	0.0	0.0	trace	0.1	0.0	trace	0.0	0.0	trace	trace	trace
Coleoptera	0.0	0.0	trace	1.2	0.3	3.0	0.0	trace	0.1	trace	trace	trace
Hymenoptera	0.0	0.0	trace	0.0	0.0	trace	0.0	0.0	trace	0.0	0.0	0.0
Hemiptera	0.0	0.0	0.0	trace	trace	0.0	0.0	0.0	0.0	trace	trace	0.0
Homoptera	0.0	0.0	0.0	trace	trace	0.0	0.0	0.0	0.0	trace	0.0	0.0
Orthoptera	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	2.7	1.8	0.2	0.0
Unidentified	0.0	0.0	0.0	0.0	0.0	trace	0.0	0.0	0.0	0.0	0.0	0.0
Totals	3.6	0.0	trace	1.2	0.7	13.1	8.2	1.9	3.9	1.8	0.2	trace

During the summer months the insect consumption was at its highest point, the peak coming in June, the period of maximum insect activity. The diet at this time of year was comprised of 13.1 per cent insects, most of which were the larvae of Lepidoptera. In July, the insect food was mostly Lepidoptera. Although insects are available in abundance in the summer, adult pheasants do not utilize them as their principal source of food. The graph in figure 2 indicates clearly just how small a portion of the year's food is animal matter. The peak of grasshopper consumption came in September and dropped to almost nothing by the end of October. During mild open winters, pheasants may be expected to feed upon the larvae of the March Fly, *Bibio* sp. The larvae of this insect are gregarious and hibernate in the litter in shrub thickets.

The larvae were eaten during January to the amount of 3.5 per cent of the month's food.

TABLE XI. *Percentages of insects, by orders, eaten by adult pheasants*

Order	Per cent of year's food	Per cent of insect food eaten
Lepidoptera	1.6	56.9
Orthoptera	0.6	19.0
Coleoptera	0.4	13.1
Diptera	0.3	10.6
Hemiptera	trace	0.2
Hymenoptera	trace	trace
Homoptera	trace	trace

The relative importance of the various orders of insects is seen in the above table. Lepidoptera, all in larvae stages, rank first in quantity of insect food eaten. The common belief that grasshoppers are consumed in large quantities by pheasants is not borne out by this investigation. Orthoptera including both locusts and field crickets, amount to only 0.6 per cent of the year's food, and only 19.0 per cent of all insect food eaten.

The largest amount of animal food consumed other than insects occurred in April. In this month, the land snail, *Polygra* sp., comprised 2.8 per cent of the food. In addition to snails, sow bugs (*Oniscus* sp.), millipedes, and spiders were found in small quantities. Of all the animals eaten by pheasants other than insects, the mollusca were most important.

SUMMARY

1. Pheasants feed little during the middle of the day, summer or winter.
2. The crop is not always full when the bird goes to roost, even though food is abundant. Approximately 14 per cent of the pheasants collected at sundown had full crops. In all cases, however, other parts of the digestive systems were full of food.
3. Habits of feeding are not uniform but are very regular with certain flocks. Areas of wild fruits are completely utilized by daily feeding throughout late fall and winter.
4. The pheasant is an omnivorous feeder; the greatest variety of seeds and fruits eaten occurred in October when 106 species were recorded.
5. The high percentage of grain eaten by pheasants is not an indication of damage to grain crops. Most of the grain consumed is waste, either from harvesting or planting, or from manure spread on the fields. Corn, wheat, and barley comprise 83 per cent of all the grain eaten.
6. In the pheasant territory of Michigan, the most common wild seeds eaten were ragweed, yellow foxtail, skunk cabbage, and green foxtail. Ragweed accounted for 51 per cent of all the seeds eaten. Wild fruits and nuts are eaten consistently, but their percentage is small (7.48), since the habitat of

these species are restricted to a relatively small proportion of the pheasant range.

7. Adult pheasants are not large consumers of insects and other invertebrates in comparison with plant food eaten. The common belief that grasshoppers are consumed in large quantities is not borne out by the investigation.

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